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van Luijk, E.W.; van Ours, J.C.

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Drug Use and Drug Policy

by

ERIC W. VAN LUIJK AND JAN C. VAN OURS *

Early in the twentieth century the Dutch East Indies (present-day Indonesia) had a government monopoly on the import, refining, and retailing of opium. There were regional differences in opium policy ranging from areas with prohibition to areas where opium use was hardly restricted. We analyze 1930 data from administrative files and find that a strict opium policy was implemented in areas in which opium use among indigenous users was low anyway. We find some evidence that a strict opium policy had a negative effect on drug use by Chinese. (JEL: D 12, I 18, N 35)

1 Introduction

Different countries have different objectives for their drug policy. In some countries, such as Sweden, illicit drug use is considered to be unacceptable. In other countries, such as the Netherlands and Australia, the elimination of drug abuse is considered to be an impossible goal. Therefore, attention is focused on the minimization of the overall harm related to drug abuse (UNITED NATIONS [1997]). The debate on drug policy is mainly on the degree of regulation of illicit drug use. Some countries favor total prohibition; others are more liberal. A general problem for participants in the debate is that not much is known about the effects of government policy on the use of illicit drugs. The lack of knowledge is caused by the illegality of the drug business, which makes it hard to collect data for empirical analysis.

This paper avoids these problems by using historical data that were collected under a government monopoly on opium. In the Dutch East Indies[1] (present-day Indonesia) a government bureau within the Finance Department controlled this so-called opium *regie*. The many adults that wanted to smoke opium could get a license to do so. There was an extensive network of official opium stores and a network of licensed opium dens where users were allowed to smoke their opium. Signs in the vernacular were posted above the *regie* stores: "Government opium for sale here" (RUSH [1990]).

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[1] Note that various other names are used for colonial Indonesia, such as "Netherlands India," "the Netherlands Indies," and "the Netherlands East Indies."

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As we describe in more detail below, there were differences in the type of opium policy imposed in different areas. In some areas the use of opium was prohibited, while in other areas it was hardly restricted. The colonial government of the Dutch East Indies produced annual reports on opium use that contain region-specific information. Information from these reports has been used in previous studies. VAN LUYK AND VAN OURS [2001] study the effect of the introduction of the opium *regie*. In VAN OURS [1995] information from the *regie* is used to estimate price and income elasticities. The opium price elasticities are in the range from −0.7 to −1.0, and the opium income elasticities are in the range from 0.8 to 1.3. Furthermore, it turns out that opium consumption was affected by opium smuggling and government licensing policy. In the study by VAN OURS [1995] time-series characteristics of the opium use are exploited while differences between districts are assumed to be fixed and are left unexplained.

In the current paper we focus on regional differences in opium policy and opium use at one point in time, the year 1930. This year is very suitable for an empirical cross-section analysis, since in it there was a population census that revealed many characteristics of the population not available for other years. Furthermore, for the year 1930 information about opium use is very detailed. There is information for 56 districts, or *residencies* as the Dutch called them, whereas usually, in Dutch colonial publications on opium, only 22 or 35 areas are distinguished. The analysis is done separately for Chinese and indigenous Indonesians.[2] We investigate the relationship between opium policy and opium use, taking into account differences between districts in demographic characteristics and possible endogeneity in the application of a particular opium policy.

The paper is organized as follows. In Section 2 we present the main characteristics of the Dutch East Indies population. Section 3 gives a short history of opium and its use in Southeast Asia. In Section 4 we discuss the Dutch opium policy. Section 5 presents the main results of our empirical analysis. Section 6 concludes.

2 *Demographics*

Table 1 gives information about the population of the Dutch East Indies, which we derived from the 1930 census. We group the 56 districts into the areas that were commonly distinguished in colonial statistics: Java with 38 districts and the Outer Islands with 18 districts. The European part of the population is not mentioned in Table 1, because the number of opium users among the 260,000 Europeans was very small. The table shows that the Chinese part of the population was also quite small. While there were almost 60 million indigenous Indonesians, there were only a little over 1 million Chinese. Java was by far the more crowded area: more than

[2] Dutch colonial society in prewar Indonesia was highly stratified in a legal sense. According to the Dutch nationality law there were Europeans (mostly Dutch), Inlanders (to whom we will refer as "indigenous Indonesians"), and Vreemde Oosterlingen ("Foreign Orientals," mostly Chinese, to whom we refer as "Chinese").

two-thirds of the indigenous Indonesians lived there. The Chinese were more evenly spread over the two areas. There were about 16 million indigenous adult males and about half a million Chinese adult males.

Table 1
Population Characteristics by Area and Ethnic Group in 1930

	Java	Outer Islands	Total
Population (million):			
Indigenous Indonesians	40.9	18.2	59.1
Chinese	0.6	0.6	1.2
Population density (per km^2)	313	14	41
Adult males (million):			
Indigenous Indonesians	11.1	5.1	16.2
Chinese	0.2	0.3	0.5
Adult male ind. Indonesians (%):			
Literate	11	17	13
Married	77	70	75
Adult male Chinese (%):			
Literate	65	41	51
Married	55	48	50
Male Chinese (%):			
Born outside	28	64	48
Income per head (guilders):			
Indigenous Indonesians	55	66	59
Chinese	310	320	315

Source: DEPARTEMENT VAN ECONOMISCHE ZAKEN [1933–1936].

For indigenous Indonesians there were substantial differences with respect to literacy. In Java only about 11% of the adult males were literate; in the Outer Islands the fraction was 17%. There was not a lot of difference with respect to the shares of married among adult male indigenous Indonesians. The literacy among Chinese adult males was much higher: 65% in Java and 41% in the Outer Islands. The percentage of married adult males was lower among Chinese than it was among indigenous males. For Chinese there were major differences in the percentages of males born outside the Dutch East Indies. In Java this was 37%, while in the Outer Islands it was 75%. Both the low marriage rate and the large share of Chinese males

born outside the Dutch East Indies were caused by the presence of many Chinese immigrants who were hired to perform specific types of labor.

In 1930 there were several socioeconomic differences between the areas. An important distinction between the Chinese in Java and the Outer Islands was the occupational structure. From the 1930 census it appears that almost 60% of the Chinese in Java were involved in trade and commerce whereas only 10% participated in the production of raw materials (mostly agriculture). In the Outer Islands 33% of the Chinese were engaged in agriculture and the production of raw materials. The indigenous Indonesians were mainly involved in agriculture, with only a few percent working in manufacturing or trade.

The differences in the structure of the working population are also reflected in the income of the people. The average per capita income of the Chinese was about five times as high as that of the indigenous population. In many respects the Chinese formed a middle class between the Dutch and the indigenous inhabitants of the Indian Archipelago. While the Dutch were mainly involved in the civil service, the army, foreign trade, and agricultural production for export, and the indigenous population was mainly involved in agriculture and fishing, the main Chinese occupation was commerce, which occupied over one-third of working Chinese in the census of 1930. Nearly one-fifth were engaged in industry, mainly as small craftsmen, and the rest were engaged in coolie labor on Dutch-owned plantations and in Dutch-owned mines.

3 Opium

3.1 A Short History

In past centuries opium was an important business in Southeast Asia. British and American traders brought opium from British India and the Ottoman Empire and exported it in large quantities to China. In smaller quantities opium was exported to areas with Chinese communities in the Straits Settlements, French Indochina, Siam (Thailand), and the Dutch East Indies. The use of opium has a long tradition in the Dutch East Indies.[3] In the early seventeenth century the Dutch started auctioning opium. After that there were several ways in which the Dutch directly or indirectly controlled the opium market in the Dutch East Indies.

In the second half of the eighteenth century the opium supply was controlled by a private organization, the so-called Amphioen Societeit. In exchange for a fixed financial contribution, the government gave this organization the right to sell opium to the highest bidder. In the nineteenth century there were opium tax farms. Lacking sufficient administrative capacity for collecting taxes, the Dutch government sold regional rights to retail opium to the highest bidder.

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[3] For an overview of the history of Indonesia see RICKLEFS [1993]. A detailed description of the nineteenth-century history of opium smoking on Java is given in RUSH [1990]. DIEHL [1993] also gives information about opium smoking in the Dutch East Indies.

At the end of the nineteenth century a new scheme, called the opium *regie*, was gradually introduced. Under this scheme the importation, refinement, and retailing of opium were fully under the control of the government. One of the explicit goals of this policy was to remove the private financial incentives to spread the use of opium.[4]

Opium consumption was a common phenomenon in Southeast Asia in the early twentieth century. Table 2 gives a description of the situation around 1930 in a number of countries. From this table it appears that in the Dutch East Indies the share of the population that used opium was small compared to other countries. In Formosa (Taiwan) 0.7% of the population consumed opium; in the Straits Settlements, as much as 4.6%. The average opium consumption per opium user also differed substantially. In the Dutch East Indies an opium smoker used 295 grams per year; in the Straits Settlements and Formosa, about 1100 grams per year. Finally, there was a big difference in the price of opium, the price in the Dutch East Indies being by far the highest. In Formosa the price was one-sixth that in the Dutch East Indies. Around 1930 the opium price in Dutch guilders per kilogram in Siam was 364, in Indochina 571, in Hong Kong 273, and in Macao 44.

Table 2
Opium Use in Some Countries around 1930

Country	Users[a]	Consumption[b]	Price[c]
Dutch East Indies	0.28	295	701
Burma	0.45	435	161
Straits settlements	4.59	1094	411
Formosa	0.67	1151	116

[a] Percentage of the population.
[b] Quantity per smoker in grams per year.
[c] Price per kilogram in Dutch guilders.
Source: PAULUS, STIBBE, AND DE GRAAFF [1935] and authors' calculations.

The opium *regie* was not a Dutch invention. The French introduced an opium monopoly in Indochina at the end of the nineteenth century. The Japanese did the same in Taiwan.

3.2 Opium Use

Although our focus is on opium consumption in the year 1930, we also present some information about 1920. For that year the information is not as detailed.

[4] VAN LUIJK AND VAN OURS [2001] find indications that the switch from opium tax farm to opium *regie* reduced opium consumption.

Opium consumption is reported for 35 districts, but no distinction is made between Chinese and indigenous Indonesians. So we can only consider the average amount per inhabitant.

From Table 3 it appears that opium consumption in 1920 was substantially higher than it was in 1930.[5] In 1920 the per capita opium consumption was 2.1 grams; in 1930, 0.8 grams. The decline was about the same (about 60%) in Java and in the Outer Islands.

Table 3
Opium Use by Area: 1920 and 1930

Quantity	Year	Java	Outer islands	Total
Opium consumption (grams/head)	1920	1.29	3.95	2.05
	1930	0.49	1.53	0.82
Opium price (gld/kg)[a]	1920	646	441	532
	1930	777	648	701
Licensed users (1000)	1920	31.7	12.2	43.9
	1930	78.3	14.5	92.8
Unlicensed users (1000)	1920		unknown	
	1930	15.9	58.4	74.3
Opium shops	1920	755	575	1330
	1930	583	468	1051
Illegal opium (%)[b]	1920	0.1	0.2	0.2
	1930	2.1	0.5	1.1
Population (million)	1920	35.0	14.2	49.2
	1930	41.5	18.8	60.3

[a] Nominal prices. The consumer price index (1920 = 100) in 1930 was 56.
[b] As percentage of legally sold opium.
[c] Price per kilogram in Dutch guilders.
Source: DIENST DER OPIUMREGIE [1921] and [1931].

The nominal opium price increased a lot between 1920 and 1930. On average the opium price in Dutch guilders per kilogram increased from 532 in 1920 to 701 in 1930, an increase of 32%. The relative increase in Java was 20%; in the Outer Islands it was 47%. One of the reasons for the difference is that the price increase was larger in areas with a low price, areas that were overrepresented in the Outer Islands. As a consequence there was less price dispersion in 1930 than in 1920. In

[5] In fact 1920 had the all-time high opium consumption for the entire *regie* period.

fact, in 1930 the opium price in most of the districts was the same, namely 777 Dutch guilders per kilogram. Only in 6 of the 56 districts there was there a lower price.

When considering the possible effect of the opium price increase one has to take into account that consumer prices went down in the 1920s. The index of consumer prices was 44% lower in 1930 than in 1920. This implies that the increase in real opium price was enormous. In 1920 guilders the price of 1 kilogram of opium in 1930 was 1252, an increase of 135% compared to 1920. Most likely the decrease in opium consumption during the 1920s has a lot to do with the increase in real opium price.

Opium was sold to persons with a license and persons without a license, depending on the specific opium policy of the district, which we will describe in more detail in the next section. For 1930 there is information about the numbers of licensed and unlicensed users; for 1920, only about the numbers of licensed users. From 1923 onward there is information about the number of unlicensed users. As indicated in Table 3, the number of licensed users increased substantially. In 1920 there were 44,000 licensed users; in 1930 there were 93,000. This big increase was mainly due to the increase in Java and is related to a change in policy that we discuss below. Note that in the Outer Islands there were many more unlicensed users than in Java.

Refined opium was produced from imported raw opium in an opium factory in Java with about 600 employees. Opium was distributed from this factory to depots and then to shops. In 1930 there were 7 depots in Java and 10 in the Outer Islands. The number of opium shops declined by about 20% in the 1920s, from 1,330 to 1,051. Opium smuggling increased, but the amount of intercepted illegal opium still was only about 1% of the legally sold opium.

In 1930 the so-called *Candu* was the only type of opium that was sold officially in the entire Dutch East Indies. The *Candu* of the state had a standard quality. It contained 11–13% morphine. Considering its narcotic effects, today one would call pure *Candu* a hard drug.

There were obvious differences in opium use between Chinese and indigenous Indonesians. From Table 4 it appears that on average a fairly large share of the Chinese population used opium. In the Outer Islands almost 15% of the Chinese male population used opium; in Java, about 6%. The opium penetration among indigenous males was on average about 0.3%, being the highest in Java. Chinese opium smokers used on average about 460 grams of opium per year; the indigenous smokers used on average 140 grams per year. For Chinese males the average consumption was about 50 grams per year; for indigenous males, 0.4 grams per year.

The average annual amount of money spent on opium was about 100 guilders for an indigenous smoker and about 320 guilders for a Chinese smoker. Again, there are substantial differences between areas. The average amount spent by indigenous smokers in the Outer Islands was 123 guilders; in Java, 101 guilders. Chinese opium smokers spent on average 451 guilders in Java and 279 guilders in the Outer Islands. Opium smokers must have spent a large fraction of their income on opium, since the

Table 4
Opium Use by Area and Ethnic Group in 1930

	Java	Outer Islands	Total
Opium penetration (% of males):			
Indigenous Indonesians	0.39	0.12	0.30
Chinese	5.6	14.6	10.7
Opium consumption (grams/male):			
Indigenous Indonesians	0.4	0.2	0.4
Chinese	32.7	62.9	49.4
Opium consumption (grams/user):			
Indigenous Indonesians	130	190	137
Chinese	580	430	463
Opium consumption (gld/user):			
Indigenous Indonesians	101	123	104
Chinese	451	279	317

Source: DIENST DER OPIUMREGIE [1931].

average income per head in the working population was 170 guilders for indigenous and 840 guilders for Chinese (POLAK [1943]).[6]

Official information with respect to opium use does not indicate that opium addiction was a severe problem. For many people using opium was very costly. Yet, it was preferred to alcohol by many, because opium did not affect outward behavior so much, so that opium users could maintain decorum. Because opium was quite expensive, the majority of opium users consumed small quantities, thereby escaping severe addiction. As RUSH [1990, p. 41] puts it, "the characteristic form of opium consumption in nineteenth-century Java was the regular or intermittent smoking of very small amounts of morphine-weak opium preparations by large numbers of Javanese people." In several hospitals opium addicts were treated for medical reasons, but their numbers were small compared to the total number of opium users. In 1930 in the Bandung hospital 2 Europeans, 23 indigenous, and 224 Chinese were treated, of whom 195 were declared cured after their treatment. In Modjowarna in 1929, 14 indigenous and 10 Chinese were treated for their addiction. In Surakarta 115 male and 2 female Chinese and 68 male and 8 female indigenous were treated, of whom 174 were declared cured after their treatment, whereas 19 failed to be cured. The medical doctor Anthony de Mol van Otterloo did some research in the 1930s among 200 opium smokers in the opium hospital Immanuel in Bandung. He

[6] Of course, this average includes many poor non-opium-smokers.

concluded that the average opium smoker was 35 years old, had been using opium for 10 years, and used 1400 grams of opium annually. In his judgement a smoker who used less opium than this amount was a recreational smoker and easy to cure. Someone who used more than 1400 grams of opium was considered a heavy smoker and difficult to cure of his addiction. Note that this amount is substantially larger than the average amount opium smokers consumed in 1930, which was 137 grams for an indigenous and 463 grams for a Chinese opium smoker (see Table 4). Therefore, the number of heavy smokers must have been substantially smaller than the number of recreational smokers. Of course, one has to take into account that only heavy opium smokers ended up in the hospital.

DE MOL VAN OTTERLOO [1933] published individual information about some 25 opium smokers. From this information we find that the use of opium ranged from 850 to 6300 grams per year. The average amount over the 25 smokers was 2390 grams per year, which drops to about 2000 if one omits the three heaviest smokers. Almost every smoker in the sample was Chinese and male (there was one female). For 18 individuals we know the age and the duration of their opium smoking. It appears that the coefficient of correlation between the amount consumed and the age of the consumer is insignificant (−0.28). Amount and duration are hardly correlated (correlation coefficient −0.03), but there is a significant coefficient of correlation (−0.47) between the amount consumed and the age at the start of the opium smoking. So, the older the age at which consumers started smoking, the smaller the quantities they smoked at a later stage.

4 *Opium Policy*

Under the *regie* the sale of opium was exclusively a government business where even retailing was done by civil servants. The use of opium was forbidden to army personnel, police, and persons under age 21. For other inhabitants there were ethnicity- and area-specific rules concerning opium use. The growing of opium poppies was forbidden.

The long-run aim of the government was to abolish opium consumption in the Dutch East Indies. There were international commitments to do so. However, there was some ambiguity in the government policy towards opium. On the one hand the government was earning a lot of money from selling opium. Total government revenue from the opium *regie* in 1930 was about 35 million Dutch guilders. On the other hand, the government supported societies that campaigned against the use of opium. However, that support was small: only 11,000 Dutch guilders in 1930.

In the short run the government had to deal with consumers who had been using opium for quite some time. Therefore, changes in opium consumption promoted by the government had to be introduced gradually. The primary short-run aim of the opium *regie* was to fulfill the existing needs for opium. The government could reduce opium use by setting a high price. However, too high a price would encourage smug-

gling. The government could also reduce opium use by prohibition or by imposing strict rules about who was and who was not allowed to buy *regie* opium. Again, if the rules were too strict, this would encourage smuggling. Of course, the government could fight opium smuggling directly, which it did, but there were obvious limits to this. If the *regie* policy made the benefits from smuggling too attractive, then imposing higher costs on the smugglers by increasing the number of interceptions of smuggled opium would have little effect. The maximum punishment for opium smuggling was 3 years of imprisonment and a penalty of 10,000 Dutch guilders. The intercepted illegal opium was destroyed. Persons who helped to intercept the illegal opium could get a reward of about 100 guilders per kilogram of intercepted opium, and in some cases they would also get as a premium the penalty imposed on the offender. If illegal opium was found on a ship, the captain and the owner of the ship could be fined 1000 Dutch guilders. To fight opium smuggling there was an opium police force that also had ships to fight opium smuggling at sea. As already indicated in Table 3, the amounts of illegal opium intercepted by the opium police were small.

Until the supply of illegal opium could be controlled and the growing of poppies prohibited in other countries too, the government considered it impossible to establish a regime of total prohibition. Therefore, the government aimed at such a limitation of the legal use of opium as was in accordance with efficient limitation of the illegal use. Conditional on not encouraging smuggling too much, the price of opium was kept high to discourage consumers. In the annual reports on the opium *regie* there are frequent remarks about why the opium prices in some of the Outer Island districts close to the Straits Settlements were lower than in most other districts. In the 1920 annual report, for example, it is noted that on January 1, 1920, when the British increased the opium price in the Straits Settlements to 42.4 cents per gram, the Dutch considered it to be feasible to raise the opium price in the districts of East Sumatra, Riau, and Aceh from 36.3 to 41.5 cents per gram.

The most interesting and most complicated part of the attempts of the government to control opium use was the license and registration policy. This policy operated on the principle of regional differentiation. The main reason for differentiating policy measures along regional lines was that the opium smoking habit did not occur everywhere at the same level. In some regions, like the Islamic regions of West Java, opium smoking was not widespread. If opium smoking was almost absent, the sale of legal opium – if there was any – was stopped, and the use of opium was actually forbidden. In other regions opium smoking was almost as common as alcohol drinking is nowadays in Western countries. This was especially the case in regions with substantial Chinese communities, and regions with large estates like the East Coast of Sumatra. The labor force on these agricultural, export-producing estates was partly recruited from other parts of East Asia, and many of these displaced temporary contract workers proved to be opium smokers on arrival, or else soon afterwards.

Simple registration of legal opium buyers started around 1910. The license policy followed a few years later. Areas within districts of the Dutch East Indies could be

under different opium regimes. The smallest area was the *subresidency*. The original idea of the license policy was to prevent new inflow into the stock of opium users. When after a careful preparation a license system was introduced in a subresidency, only those inhabitants who could prove that they had been using opium before would get a license. Licenses were only given at the introduction of the license system in the area. Afterwards no new licenses were issued. The idea was that without inflow of new users the stock of opium users would gradually die out, so that after a while opium use could be prohibited.

In the course of the 1920s the license policy was adjusted to make it possible to issue new licenses even after the policy was introduced in an area. License conditions were severest from 1924 until 1927. During this period there was no sale of legal opium to others than licensees throughout Java. In 1927 the system was modified. There were indications of increasing illegal use of opium and other drugs (especially morphine) by non-license-holders. In response, it was made easier to obtain a license. Nevertheless licenses remained obligatory in most regions of Java. In other regions part of the population, mainly the Chinese, were brought under the less severe obligation of customer registration. Again, the measures that were taken differed between regions.

The license and registration system was not only applied to curtail the number of opium users, it was also used to limit the amount of opium that users consumed. The quantities sold in the opium shops of the state were of limited size. It was not permitted to buy more than once a day, and registration made this control possible. Moreover, licensees were limited to a certain maximum monthly sale as prescribed in their licenses. Information on the period 1927–1938 shows that the number of available licenses was never exhausted. Also, the average sale per user was far below the maximum.

In 1930, with respect to opium policy, the following four types of areas were distinguished:[7]

Closed Areas. The use of opium was forbidden for everyone. In closed areas the danger of illegal opium trade was thought to be limited because the demand for opium was very small. The main reason for not establishing a closed area was that enforcement would have been difficult so that illegal opium trade would arise.

License Areas. The use of opium was permitted to those who had a license. Licenses were given to persons who were regular opium smokers. They were only allowed to buy opium for their personal use. The head of the district administration had the authority to distribute licenses. A license was given when the need for opium had to be fulfilled in a legal way because an illegal way could not be prevented. As a rule,

[7] None of the districts was completely closed. Even in Banten and in the Priangan districts that had had closed areas for over a hundred years, the cities had a mixed opium regime where opium use was prohibited for indigenous Indonesians but allowed for licensed Chinese. The Appendix gives details about the opium policy imposed in each district.

to people entering an area no licenses were given. However, exceptions were made often for economic reasons, for example, for new Chinese tin-worker immigrants who could show that they had been using opium on their arrival. License holders had a permit that indicated the maximum amount they could buy. Amounts bought were registered on the back of the permit.

Open Areas. The use of opium was allowed for everyone except those for whom there was a general prohibition. The amount of opium persons were allowed to possess was limited. Open areas were areas where it was difficult to control the illegal import and sale of opium. These were areas with high population mobility (mostly harbor cities).

Mixed Areas. In these areas different opium regimes were applied to different population groups. For some groups opium use was permitted as in an open area, while other groups were subject to a license system.

In the empirical analysis we use an indicator variable for the type of opium policy that increases in the strictness of the rules. The indicator variable I has the following values: $I = 0$ for open areas or open + mixed areas with a low opium price, $I = 1$ for districts with open areas or open + mixed areas, $I = 2$ for districts with licensed opium use areas, $I = 3$ for districts with closed areas.

We specify opium policy as follows:

$$I_i^* = Z_i\gamma + u_i, \tag{1}$$

where Z is an explanatory variable, i is a subscript for district, γ is a vector of coefficients, and u is a disturbance term.

In our analysis we try to take endogeneity in the choice of a specific opium policy into account. In our search for suitable instruments we investigated the possibility of using information from the year 1920. From the relevant literature we had the impression that a closed district was not created when there was a substantial share of Chinese in the population. Our identifying assumption is that the 1920 share of Chinese in the population affects the type of opium regime implemented but not (directly) opium consumption. The first part of this assumption can be tested by regressing the opium regime indicator on the share of Chinese. The estimation results are presented in Table 5. It appears that, indeed, the larger the 1920 share of Chinese in the population, the less likely it is that a strict opium policy was enforced.[8] The second part of our identifying assumption cannot be tested and has to be motivated. We argue that it is unlikely that the composition of the population in a particular district affects the opium consumption of each of the separate groups. One could imagine that Chinese among whom opium penetration was substantially higher than among indigenous Indonesians provided some sort of role model, so that

[8] The parameters are estimated using OLS. To allow for the discrete nature of the opium policy variable, we also estimated an ordered probit model, but found very similar results.

the presence of more Chinese could induce a larger group of indigenous Indonesians to start consuming. However, since the population share of Chinese was on average only about 4%, and of Chinese males on average only 10% smoked opium, we feel that a direct effect of the share of Chinese on opium use is highly unlikely. Therefore, we think it is valid to use the 1920 population share of Chinese as an instrumental variable.

Table 5

Estimation Results: Opium Regime and Opium Penetration by Ethnic Group, 1930[a]

Opium regime		Opium penetration		
			Value	
Statistic	Value	Statistic	Indigenous	Chinese
Share Chinese	−0.39 (3.3)	Population density	2.53 (4.8)	1.39 (2.3)
Constant	2.20 (21.8)	Share foreign born	—	2.37 (3.5)
$\overline{R}^2$	0.249	Opium regime (δ)	−0.31 (2.8)	−0.20 (2.0)
		Constant	0.97 (3.7)	3.12 (6.4)
		$\overline{R}^2$	0.284	0.357

[a] In parentheses, absolute t-values based on robust standard errors; 56 observations.
Share Chinese = logarithm of the 1920 share of Chinese in the population.
Share foreign born = share of Chinese population born outside the Dutch East Indies.

5 *Penetration of Opium Use*

In our empirical analysis we investigate to what extent differences in opium use between districts can be explained by differences in district characteristics or differences in opium policy imposed on the districts. We assume that the following model applies to the use of opium in district i by group j ($j = 1, 2$):

$$\ln(Y_{ij} + 1) = X_{ij}\beta + \delta_j I_i + v_{ij} \qquad \text{for } j = 1, 2, \tag{2}$$

where Y refers to opium penetration (the share of males that use opium),[9] X is a vector of district characteristics, I is the indicator variable for the type of opium policy where a higher value means a stricter opium policy, and the effect of the opium policy is measured by the parameter δ. Furthermore, β is a vector of coefficients and v is a disturbance term.

[9] As an alternative to opium penetration we also used opium consumption (opium use in kilograms per person) as dependent variable, but the results were very much the same. This suggests that most of the variation between the districts was in opium penetration and not in consumption per user.

We use the following explanatory variables, specified at the district level:

Population density (inhabitants per square kilometer): This variable is expected to have a positive effect on opium penetration. The higher the density of the population, the easier it is to consume opium because of the prevalence of opium shops, dens, etc.

Share of male Chinese born outside the Dutch East Indies (only for Chinese): As indicated before, there are large differences in this share that probably reflect the extent to which the Chinese males are working as "coolies." The hard labor of these Chinese also stimulated their opium consumption. So we expect this variable to have a positive effect on the penetration of opium use among Chinese.

OLS parameter estimates are shown in Table 5. It appears that population density has a positive effect on opium penetration for both groups in the population. In addition, the share of Chinese males born outside the Dutch East Indies also has a positive effect on the penetration of opium use among Chinese. Finally, we find for both population groups that a stricter opium policy reduces opium penetration.

To investigate the robustness of our estimation results with respect to particular assumptions we make, we performed a detailed sensitivity analysis. We considered a dummy for Java and the following 1930 variables: share of literate people, share of taxpayers, share working in the primary sector of the economy, and per capita amount of intercepted illegal opium. We investigated whether each of these variables had a direct effect on opium use, but none of them did. We experimented with income-tax variables as indicators of income, but that also was unsuccessful: Neither the share of the population paying tax nor the average income tax per head appeared to have an effect on opium use.[10]

So it seems as if a strict opium policy had an adverse effect on the penetration of opium use. However, from the description of the opium policy in the previous section it is clear that the policy variable I_i cannot be treated as exogenous. As discussed before, the government imposed a strict regime in those districts that already had low opium use. If we did not allow for the selectivity in the imposition of a strict opium regime, we would overestimate the effect of such a regime. To allow for selectivity we assume that v_i and u_i are drawings from a bivariate normal distribution with correlation ρ. Then if ρ differs from zero, this implies that a particular type of opium policy is not imposed randomly. We estimate the parameters using the method of maximum likelihood. Since the parameters related to population density and share of foreign-born Chinese are not very much influenced by the alternative estimation procedure, we only report estimates for δ and ρ, in Table 6.

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[10] The main problem here is that income taxes may not represent income very well. Persons with an annual income of more than 120 Dutch guilders had to pay income tax. However, farmers in Java paid land tax instead of income tax. Their annual income could exceed 120 Dutch guilders without their having to pay income tax. Another problem is that income-tax enforcement in the 120–600-guilder income range was very haphazard (see REYS [1925]).

Table 6
Estimation Results: Opium Regime and Opium Penetration by Ethnic Group, 1930[a]

	Indigenous population			Chinese population		
	δ	ρ	−Log likel.	δ	ρ	−Log likel.
1	−0.00 (0.0)	−0.44 (2.2)	118.8	−0.26 (1.5)	0.12 (0.5)	103.0
2	−0.31 (2.9)	0	120.3	−0.20 (2.1)	0	103.0
3	0	−0.45 (3.7)	118.8	0	−0.27 (1.8)	104.0
4	0	0	123.7	0	0	105.5

[a] In parentheses, absolute t-values; 56 observations.

As shown there, for indigenous Indonesians the correlation parameter ρ is significantly smaller than zero, while the policy parameter δ does not differ significantly from zero. If we restrict $\rho = 0$, we get an estimate of δ in which selectivity in the imposition of the opium regime is not allowed for and that is equivalent to the estimate shown in Table 5. The reduction in the value of the log likelihood is not significant at the 5% level. If we restrict $\delta = 0$, we find that the value of the log likelihood hardly changes. If we restrict $\rho = \delta = 0$, we find a significant drop in the value of the log likelihood. From all this we conclude that the choice of type of opium policy was related to the penetration of opium use among the indigenous population. Once we allow for this, we do not find that the strictness of the opium policy reduced opium penetration.

For Chinese, Table 6 shows that neither δ nor ρ is significantly different from zero if we estimate them jointly. If we restrict one of them to zero, the other is significantly smaller than zero, although for ρ this is only at a 10% level of significance. If we restrict $\rho = \delta = 0$, we find that the log-likelihood value drops significantly from the estimate where we restricted $\rho = 0$.[11] From this we conclude that the strictness of the opium policy had an adverse effect on opium use among Chinese.

6 Conclusions

This paper studies the effect of opium policy on opium consumption in 1930, when – in the area under consideration, the Dutch East Indies – the opium business was controlled by the government. We investigate to what extent differences in opium use between districts can be explained by differences in characteristics of the districts themselves and differences in the opium policy imposed on them. We find that

[11] The likelihood-ratio test statistic equals 4.96, which is significant at the 5% level (the χ^2 statistic for one degree of freedom is 3.84).

Table 7
Districts by Type of Opium Policy

Area type	Countries
	Java
Closed	Banten, Buitenzorg, Krawang, Ceribon, Indramayu, West Priangan, Mid Priangan, East Priangan, Pekalongan, Tegal, North Banyumas, South Banyumas, Wanasaba, Kedu, Bagelen, Pasuruan, Probolinggo, Bandawasa,
Open	Batavia, Semarang, Surabaya
No other types	Kedus, Rembang, Blora, Mojokerto, Grisee, Bodjanegara, Madiun, Panagara, Kediri, Blitar, Malang, Djember, West Madura, East Madura, Yogyakarta, Klaten, Surakarta
	Other islands
Closed	West Sumatra, Tapanuli, Jambi, Aceh, Moluccas, Bali and Lombok
Closed + open	Manado
Mixed	Belitung, West Borneo, South and East Borneo
Mixed + open	Palembang, Sumatra East Coast, Riau
Open	Celebes, Timor
No other types	Bengkulu, Lampung Districts, Bangka

the penetration of opium use was higher in districts that had a higher population density, and – among Chinese – in districts with a larger share within the group of Chinese males who were born outside the Dutch East Indies. We find that strict opium policies were implemented in areas where opium use among indigenous Indonesians was low anyway, while opium use was hardly restricted in those areas where it was common among indigenous Indonesians. Rather than opium use among indigenous Indonesians being influenced by the type of policy, it was the type of opium policy that followed opium use. With respect to the Chinese population we find some evidence that stricter policy reduced the penetration of opium use.

Appendix: Information about the Data

Information about opium consumption was published in the annual account of the opium *regie* of the years 1930 (DIENST DER OPIUMREGIE [1931]) and 1920

Table 8
Information about Variables

Quantity	Mean	Minimum	Maximum
Opium penetration:			
Chinese	6.05	0.06	27.6
Indigenous Indonesians	0.28	0.001	1.52
Share Chinese	0.04	0.002	0.47
Born elsewhere	0.36	0.09	0.81
Population density	251	3.5	671

(DIENST DER OPIUMREGIE [1921]). Other information about opium consumption is available in the chapter "Finances of the State" in the annual colonial reports (DEPARTEMENT VAN KOLONIËN [1931]). Information on the population was published in reports of the census of 1930 in the Netherlands Indies (MINISTRY OF ECONOMIC AFFAIRS [1936]). In 1930 every district had at least one area in which licensed opium use was allowed. The other types of areas within the districts are given in Table 7.

So, for example, in Banten there were two types of areas, licensed and closed; in Batavia there were licensed and open areas; etc. The definitions of the variables we use in the analysis are the following (all specified at the district level for 1930): *opium penetration* (number of opium users divided by the number of male inhabitants), *share Chinese* (number of Chinese inhabitants divided by the total number of inhabitants), *born elsewhere* (number of Chinese males born outside the Dutch East Indies divided by the total number of Chinese males), *population density* (number of inhabitants per square kilometer).

Table 8 shows averages and minimum and maximum values for the variables used in the analysis (56 districts).

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Eric W. van Luijk
Ministry of Social Affairs and Employment
P.O. Box 90801
2509 LV The Hague
The Netherlands
E-mail: evluijk@minszw.nl

Jan C. van Ours
Department of Economics
Tilburg University
P.O. Box 90153
5000 LE Tilburg
The Netherlands
E-mail: vanours@uvt.nl